CLAIMS

What is claimed is:

1. A bubble-ink jet print head comprising:

a substrate having ink chambers to store ink and resistance heat emitting bodies to heat ink disposed thereover; and

an ink supply passage which penetrates the substrate and which is connected with the ink chambers, the ink supply passage including:

a first trench formed at a first surface of the substrate in a first pattern having a separat ing distance from at least one of inlets of the ink chambers and connecting portions between the adjacent ink chambers, the first surface of the substrate having the ink chambers disposed thereover, and

a second trench formed at a second surface of the substrate in a second pattern, having one of an area equal to and an area smaller than that of the first trench in the range of the first pattern of the first trench, and in communication with the first trench.

2. The print head of claim 1, wherein the first trench has a depth from 5μm to 20μm.

3. The print head of claim 1, wherein the separating distance is from 1μm to 5μm.

4. The print head of claim 1, wherein the second trench is formed to have a width wider than that of the first trench.

5. A fabrication method of a bubble-ink jet print head comprising:

forming a first trench at a first surface of a substrate by an etching process to communicate with ink chambers to be formed later; and

forming a second trench at a second surface of the substrate by a dry etching process to communicate with the first trench,

wherein the first and the second trenches comprise an ink supply passage penetrating the substrate.

6. The method of claim 5, wherein the forming the first trench comprises:

forming an etch mask for forming the first trench over the first surface of the substrate;

etching the first surface of the substrate by one of a wet etching process and a dry etching process using the etch mask; and

removing the etch mask.

7. The method of claim 6, wherein the etch mask is one of a pattern by which first trench is separated by a distance ranging from 1μm to 5μm from at least one of inlets of the ink chambers and connecting portions between the adjacent ink chambers.

8. The method of claim 6, wherein a shape of the first etch mask comprises a closed curve spaced apart from the outline of the ink chambers, irrespective of a coordinate disposition of injection nozzles.

9. The method of claim 7, wherein the etch mask is formed of at least one material selected from the group consisting of a silicon nitride, nitride, photo resist, epoxy resin, and metal.

10. The method of claim 6, wherein the dry etching process yields a depth ranging from 5μm to 20μm and uses one of SF_6 gas, CF_3 gas, and CHF_3 gas as an etch gas, and

wherein the wet etching process yields a depth ranging from 5μm to 20μm and uses as an anisotropic etch solution at least one material selected from the group consisting of a TMAH and a KOH.

11. The method of claim 6, wherein the first trench has a depth from 5μm to 20μm.

12. The method of claim 6, wherein the removing includes flowing organic matter into the surfaces of the substrate.

13. The method of claim 5, wherein the forming the second trench comprises:

forming an etch mask for forming the second trench on the second surface of the substrate;

etching the second surface of the substrate by a dry etching process using the etch mask; and

removing the second etch mask.

14. The method of claim 6, wherein the removing includes flowing organic matter flowing into the surfaces of the substrate.

15. The method of claim 13, wherein the etch mask has a pattern having one of an area equal to and an area smaller than that of the first trench.

16. The method of claim 15, wherein the etch mask is formed of at least one material selected from the group consisting of a silicon nitride, nitride, photo resist, epoxy resin, and metal.

17. The method of claim 16, wherein the etch mask comprises one of a photo resist layer patterned through the photolithography process and a silicon oxide, nitride, epoxy resin film, and pure metal film.

18. The method of claim 13, wherein the dry etching process uses one of SF_6 gas, CF_3 gas, and CHF_3 gas.

19. The method of claim 5, further comprising forming ink chambers and injection nozzles over the first surface of the substrate between the forming operations.

20. The method of claim 19, wherein the forming the ink chambers and the injection nozzles comprises:

forming a photo resist layer over the first surface of the substrate;

forming a chamber plate by patterning the photo resist layer through a photolithography process of using a mask in which respective flow channel structures of the ink chambers and the ink supply channels which composes restrictors are patterned;

forming a dry film resist layer on the chamber plate; and

forming a nozzle plate by patterning the dry film resist layer through a photolithography process of using a mask in which a structure of the injection nozzles is patterned.

21. The method of claim 19, wherein the forming the ink chambers and the injection nozzles comprises:

forming a first photo resist layer over the first surface of the substrate;

forming a photo resist mold by patterning the first photo resist layer through a photolithography process;

forming a second photo resist layer over the first surface of the substrate over which the photo resist mold is formed; and

patterning the second photo resist layer through a photolithography process of using a mask in which a structure of the injection nozzles is patterned.

22. The method of claim 21, further comprising removing the photo resist mold after the forming the second trench.

23. The method of claim 5, further comprising forming the ink chambers and injection nozzles over the first surface of the substrate after the step of forming the second trench.

24. The method of claim 23, wherein the forming the ink chambers and the injection nozzles comprises:

forming a dry film resist layer over the first surface of the substrate;

forming a chamber plate by patterning the dry film resist layer through a photolithography process of using a mask in which a flow channel structure of the ink chambers and the ink supply channels comprising restrictors is patterned; and

adhering one of a nozzle plate being made of a photo resist and so on and a nozzle plate being made of a polyimide film on the chamber plate with a heat and a pressure, the nozzle plate being made of the photo resist and so on being fabricated by an electrolytic deposition of using a substrate having a mandrel and the nozzle plate of the polyimide film being fabricated to have nozzles formed therein by a laser ablation.

25. An ink-jet print head, comprising:

a substrate;

at least one heater formed on a top surface of the substrate which heats ink disposed;

an ink chamber disposed at least partially over the at least one heater; and

an ink supply opening extending through the substrate, the ink passage in fluidic communication with the ink supply chamber and the ink chamber, the ink supply opening including

a first trench formed at an ink chamber side of the substrate in a first pattern having a separated distance from at least one of inlets of the ink chambers and connecting portions between the adjacent ink chambers, and

a second trench formed at a second surface of the substrate in a second pattern having one of an area equal to and an area smaller than that of the first trench in the range of the first pattern of the first trench, to communicate with the first trench.

26. A bubble-jet print head fabrication method comprising providing an ink supply opening by:

forming a first trench at a first surface of a substrate by an etching process to communicate with at least one ink chamber to be formed later; and

forming a second trench at a second surface of the substrate by a dry etching process to communicate with the first trench.

27. A method of improving measure accuracy degraded due to notches generated when forming an ink supply channel through a substrate by only one of a dry etching process and a wet etching process, comprising forming a first ink supply channel by etching two trenches having sizes different from each other through the dry and/or the wet etching processes at the front and the back surfaces of a substrate.

28. A method of compensating for measuring errors in an etching of an inlet of an ink supply channel and enlarging a processing margin for such etching, comprising:

forming a first trench at a first surface of a substrate by an etching process to communicate with at least one ink chamber to be formed later; and

forming, after forming the first trench, a second trench at a second surface of the substrate by a dry etching process to communicate with the first trench,

wherein an area of the first trench opening is larger than that of the second trench opening.

29. A method of preventing ink leakage in a bubble-jet print head, comprising:

enlarging a contact area between a substrate and the ink cartridge by

forming a first trench at a first surface of a substrate by an etching process to communicate with at least one ink chamber to be formed later; and

forming a second trench at a second surface of the substrate by a dry etching process to communicate with the first trench.